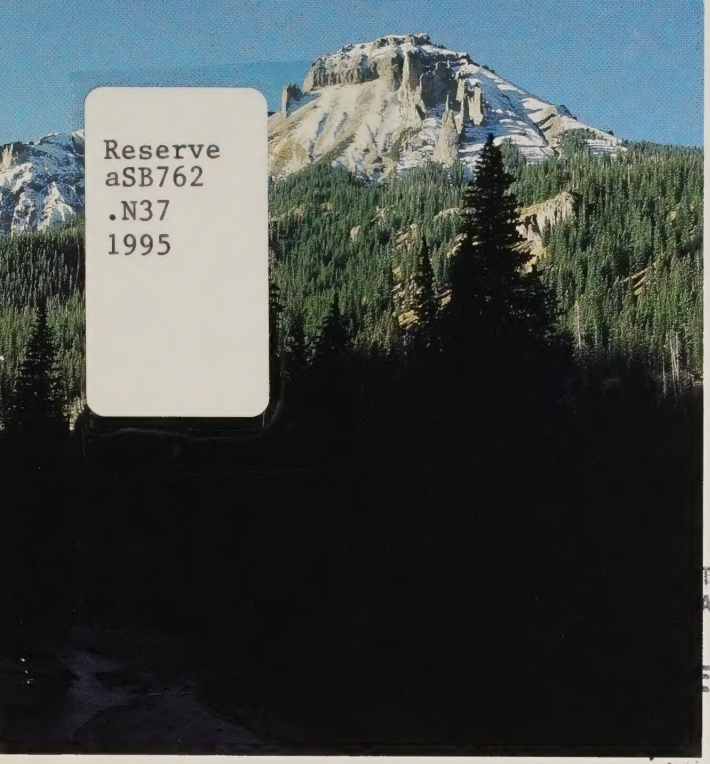

SUE & BILL BLUNT

USDA FOREST SERVICE

National Forest Health Monitoring Program

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Healthy forests are vital to our country. They provide clean water, wildlife habitat, wood for building materials and paper products, solitude for our souls, and a wide range of recreational opportunities. Our country's need to protect and expand these and other important forest benefits is the foundation for the Forest Health Monitoring (FHM) program.

MIKE SCHOMAKER

Determining compass bearing to next tree.

FHM Participants

The Forest Health Monitoring program is jointly managed and largely funded by the USDA Forest Service and the U.S. Environmental Protection Agency (through its Environmental Monitoring and Assessment Program) in cooperation with other program participants. FHM partners—participating State forestry agencies, the USDI Bureau of Land Management, the Tennessee Valley Authority, and the USDA Soil Conservation Service—provide additional funding and personnel support. Other participants include universities and three additional USDI agencies—the U.S. Fish and Wildlife Service, the U.S. Geological Survey, and the National Park Service. The National Association of State Foresters provides essential support, guidance, and assistance.

Program Goal and Objectives

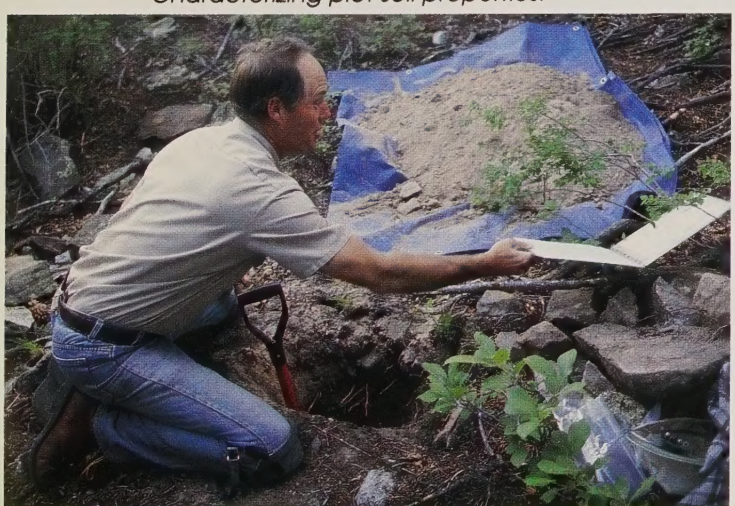
The overall goal of FHM is to monitor, assess, and report on the status, changes, and long-term trends in the health of the Nation's forest ecosystems. To do this, the program has three objectives. The **first** objective is to determine the current status, changes, and trends in indicators of forest ecosystem health. The **second** is to identify associations between changes or trends in ecosystem-health indicators and indicators of natural and human-caused stress. The **third** is to report on the health of the Nation's forest ecosystems to those who make resource management, protection, or policy decisions, and to the public.

How We Monitor Forest Health

Although forest health can be defined in several ways, there is general agreement on a few important attributes of healthy forest ecosystems. These include a balance among growth, mortality, and regeneration; appropriate biological diversity; and the ability to withstand or recover from impacts of various stressors such as insect or disease outbreaks, adverse weather and climate, and air pollution.

To measure and report on these and other attributes of forest ecosystem health, FHM uses three monitoring activities—each providing a different level of information and each with specific, complementary goals.

Characterizing plot soil properties.



MIKE SCHOMAKER

Setting up a plant diversity subplot.

BILL HOFFARD

Detection Monitoring has two components, called plot and off-plot monitoring, which cover all forested lands. The entire plot component for the lower 48 States is a network of approximately 12,600 (about 3,800 forested) permanent plots on which survey teams will make periodic measurements of forest status on the forested plots. This sampling approach will need modification to address logistical and forest resource differences in Alaska and Hawaii.

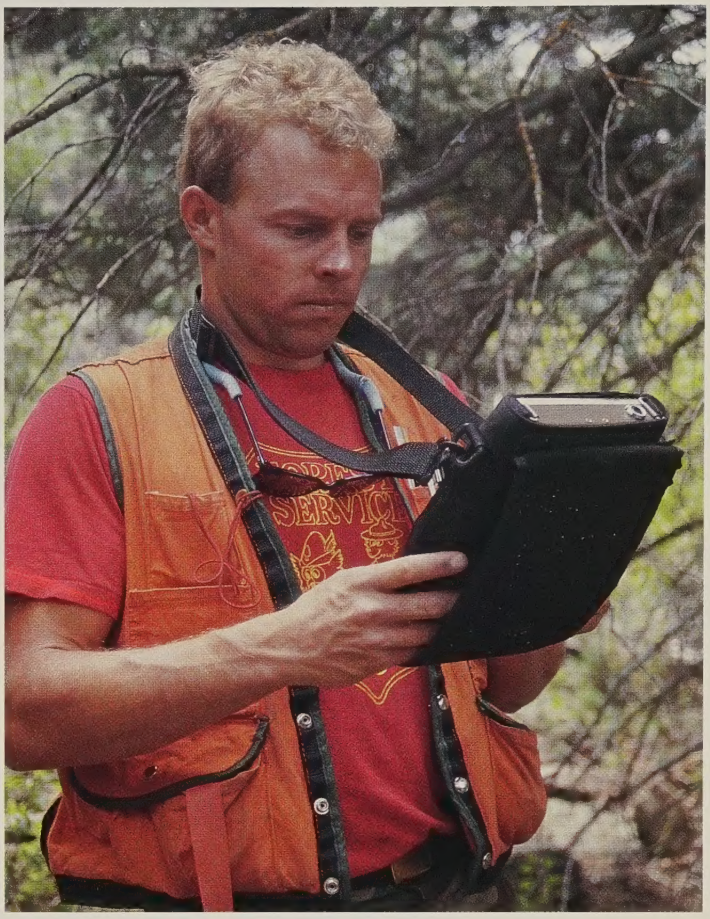
On the forested plots, survey teams collect data on forest health indicators. These data include recorded observations of stand structure, growth, mortality, crown condition, damage, regeneration, biodiversity, wildlife habitat, soil characteristics. and air pollution indicator plants. This list of measurements will change as researchers discover new and better indicators of forest health.

The off-plot component consists of aerial and other surveys of forested areas to detect and assess large-scale damage from insects, diseases, and other stressors.

Information from these two components allows FHM participants to assess the health of forest ecosystems, first by establishing current (baseline) conditions and then by evaluating changes and long-term trends from those baselines over time. The next step is to determine if these changes are expected, or if they are cause for concern and warrant additional study.

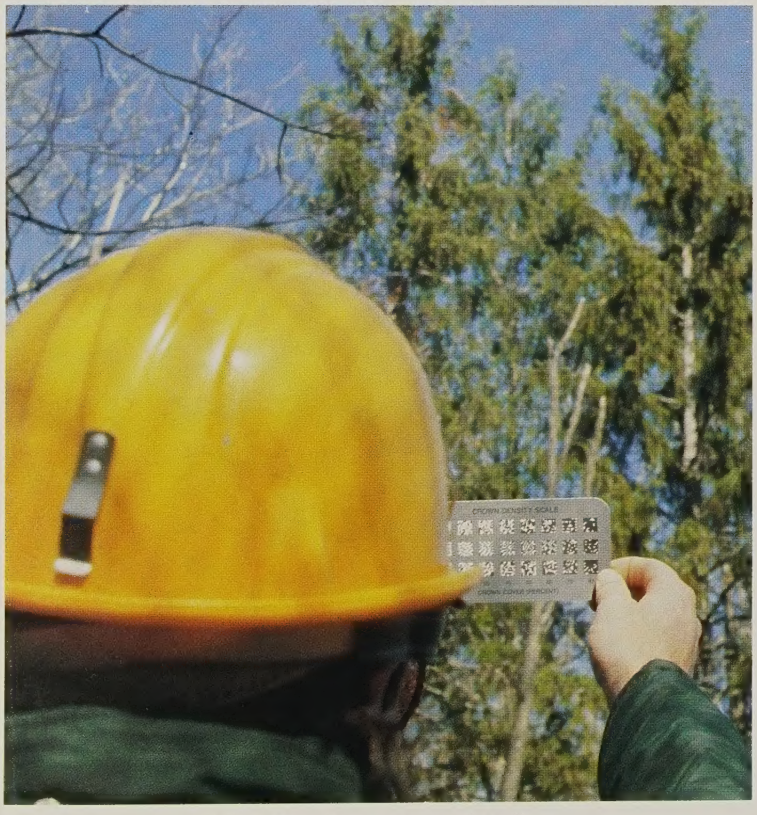
Evaluation Monitoring begins when Detection Monitoring reveals unusual changes in forest health. One purpose of Evaluation Monitoring is to determine the extent, severity, and causes of undesirable changes. Another is to provide additional information on forest health improvements. Reports from evaluation monitoring will identify likely cause-and-effect relationships, propose associations between forest health and forest stress indicators, provide information for management responses, and identify follow-up research needs.

MIKE SCHOMAKER



Recording field data electronically.

BILL HOFFARD



Estimating tree crown density.

Intensive Site Ecosystem Monitoring supports Detection and Evaluation Monitoring by giving detailed information on the processes that shape forest ecosystems. To understand these processes and predict changes, FHM scientists will monitor key ecosystem components and processes at a few carefully chosen research sites. These sites represent 20 major forest ecosystems in the United States.

A fourth FHM activity, **Research on Monitoring Techniques,** supports the three monitoring activities with studies on the biological, statistical, and analytical methods for monitoring forest ecosystems. It has two purposes: develop, test, and improve the forest health indicators that will track the status of important ecosystem components; and provide the technology needed to make continual improvements in the efficiency and effectiveness of the FHM program.

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NATIONAL ASSOCIATION OF STATE FORESTERS FOUNDED 1920

EPA

MAJOR FOREST TYPES

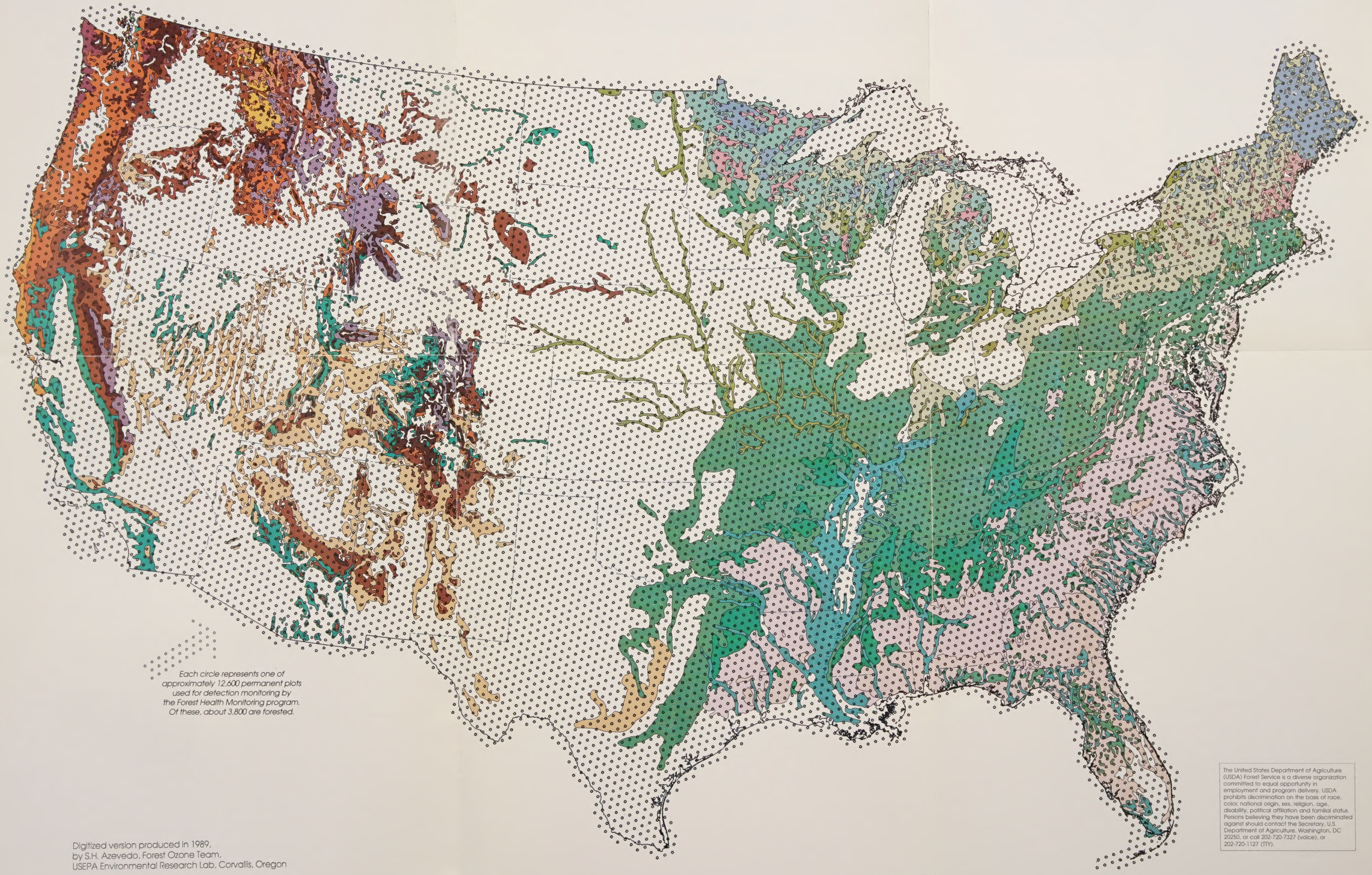
JANUARY 1995

WESTERN

- Douglas-Fir
- Hemlock—Sitka Spruce
- Redwood
- Ponderosa Pine
- White Pine
- Lodgepole Pine
- Larch
- Fir—Spruce
- Western Hardwoods
- Chaparral
- Pinyon—Juniper
- Spruce—Hardwoods

EASTERN

- White—Red—Jack Pine
- Spruce—Fir
- Longleaf—Slash Pine
- Loblolly—Shortleaf Pine
- Oak—Pine
- Oak—Hickory
- Oak—Gum—Cypress
- Elm—Ash—Cottonwood
- Maple—Beech—Birch
- Aspen—Birch



Each circle represents one of approximately 12,600 permanent plots used for detection monitoring by the Forest Health Monitoring program. Of these, about 3,800 are forested.

Digitized version produced in 1989,
by S.H. Azevedo, Forest Ozone Team,
USEPA Environmental Research Lab, Corvallis, Oregon

USDA Forest Service

National Association of State Foresters

EPA

The forests of the United States have changed considerably since European settlement. Earlier generations cut large tracts of timber to support economic growth and to make way for towns, roads, and agriculture. Millions of acres burned or were damaged, both by native insects and diseases and by pests from abroad. Today's forests and their current condition result from many interacting influences: from normal evolutionary processes to the effects of weather, fire and fire control, harvesting, and air pollution.

Forests reflect these influences in several ways. The relative abundance of important tree species has changed in many areas. Several native insects and diseases are more damaging than in the past, and introduced pests such as gypsy moths and white pine blister are now an unwanted part of the landscape. In parts of the West, forest fire control and other management practices have had the unintended effect of producing a new mix of tree species—a mix that has lower resistance to forest pests, fire, and drought. More recently, concerns have been growing about the added effects of air pollution and global warming when combined with other forest stressors. The combined effects of air pollution, insects and diseases, and weather are evident in damaged conifer forests of Southern California and in declining, high-elevation spruce-fir forests of the Northeast.

Because of increasing public focus on the health and future of our forests and the many benefits they provide, several Federal and State agencies launched FHM in New England in 1990. FHM is now a national interagency program for measuring and reporting on the health of the Nation's forest ecosystems.

Regional Implementation

Forest Health Monitoring is a national program that is being implemented regionally—North, South, Intermountain, and West Coast—to provide national and regional estimates of forest ecosystem health. The first focus is on major forest types. Examples include loblolly-shortleaf pine and spruce-fir in the East, and Douglas-fir and lodgepole pine in the West. Within regions, the program expands as individual States join those already participating in FHM. The extent and direction of expansion depends on FHM resources, the location of major forest types, and a State's ability to participate. The National Association of State Foresters provides information and advice that is essential to FHM program planning. Once a State has been selected for monitoring, FHM regional coordinators negotiate the details of participation with individual State agencies.

With this implementation strategy, FHM first concentrates on acquiring regional forest health information about major forest types. As more and more States join the program, all of the Nation's forests will eventually be included.

Forest Health Reporting

Periodic reports are essential for disseminating forest health data and analyses to a wide range of individuals and groups: resource managers, decisionmakers, resource protection agencies and groups, scientists, and the general public. These reports summarize annual data from the previous field season, make periodic assessments of forest health status, and describe a variety of other FHM activities, research results, and methods. As the program becomes established across the Nation, national, regional, and State coordinators will report monitoring results in a variety of publications.

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International Cooperation

To develop internationally recognized procedures, standards, and guidelines, FHM scientists work closely with colleagues in other countries. For example, initial monitoring coordination is underway with Canada's Acid Rain National Early Warning System program, the North American Forestry Commission, the United Nations International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forests, and various Central and East European countries under bilateral agreements. Benefits resulting from international cooperation include (1) integration of FHM with related programs world-wide, (2) exchange of information on monitoring design, technology, and methods, (3) development of approaches for expanding national forest health monitoring to a global level.

More Information

For a list of current FHM reports, a map showing Detection Monitoring implementation progress, or more information about the FHM program, please contact the State, regional, or national office listed below: